MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2022/2023

BDS4614 – MANAGEMENT DECISION SCIENCE

(All sections/Groups)

5th OCTOBER 2023
9.00 a.m – 12.00 p.m
(3 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of **6** printed pages excluding the cover page, with **5** questions only.

2. Attempt **ALL** the questions. All questions carry equal marks and the distribution of the marks for each question is given.

3. Students are allowed to use non-programmable scientific calculators (without restriction).

4. All necessary workings must be shown and please write all your answers in the answer booklet provided.

QUESTION 1

A small company manufactures three different electronic components for computers. Component I requires 2 hours of fabrication and 1 hour of assembly; component II requires 3 hours of fabrication and 1 hour of assembly and component II requires 2 hours of fabrication and 2 hours of assembly. The company has up to 1000 labor hours of fabrication time and 800 labor hours of assembly time available per week. The combined number of components produced each week cannot exceed 420. The profit of each component, I II and III are RM7, RM8 and RM10 respectively.

The Final Simplex Tableau for the above problem is given below:

		7	8	10	0	0	0	
Cj	Solution Mix	X1	X2	X3	S1	S2	S3	Quantity
0	S1	-1	0	0	1	1	-4	120
10	X3	0	0	1	0	1	-1	380
8	X2	1	1	0	0	-1	2	40
	Zj	8	8	10	0	2	6	4120
	Cj-Zj	-1	0	0	0	-2	-6	

S_1 – Slack for the fabrication hours available
S_2 – Slack for the assembly hours available
S_3 – Slack for the total production

a) Formulate the above as a linear programming problem. (4 marks)

b) Set up the Initial Simplex Tableau for the above problem. (2 marks)

c) Based on the Final Simplex Tableau given above, state the optimal mix and the associated maximum profit? (2 marks)

d) What are the shadow prices of the constraints and explain what it means. (4 marks)

e) Over what range can the maximum assembly hours vary within which the current shadow price remains valid? (4 marks)

f) Determine the range of optimality for the profit contribution of the Component II. (4 marks)

(Total: 20 marks)

Continued...

QUESTION 2

a. The following table shows the demand, supply and shipping cost (RM) per unit of a company

TO / FROM	P	Q	R	X	SUPPLY
A	15	6	11	7	350
B	13	5	9	8	400
C	11	X	6	9	450
D	12	7	8	11	300
DEMAND	300	200	500	500	

The X indicates that no unit shall be shipped from C to Q.

i. Use VAM to find an initial solution and then apply the MODI technique to find the optimal shipping plan. What is the minimum total cost?

(8 marks)

ii. Is there any alternate optimal solution? If yes, why?

(2 marks)

b. The following table presents the cost (RM) incurred for all possible combinations of four workers and tasks waiting for processing.

Worker	Task			
	I	II	III	IV
A	1500	1500	1450	1300
B	1600	1600	X	1400
C	1900	1400	1500	1500
D	1700	1500	1700	1400

The X indicated that Task III couldn't be assigned to Worker B.

(10 marks)
(Total: 20 marks)

Continued...

QUESTION 3

The following table shows a list of activities to be completed before the opening of a new Asian food restaurant.

Activity	Immediate Activity	Time (weeks)		
		Optimistic	Most Likely	Pessimistic
A	-	2	6	10
B	-	4	5	6
C	A	5	6	7
D	A, B	6	8	10
E	C, D	4	5	6
F	B, D	4	6	10
G	E	4	6	8
H	E, F	4	8	12
I	H, G	3	5	12
J	I	4	8	10
K	I, J	3	4	5
L	K	3	6	9

a. Draw a network diagram to represent the problem.

(5 marks)

b. Compute the expected time and variance for each of the activities.

(4 marks)

c. Determine the critical path.

(4 marks)

d. Calculate the expected completion time and variance of the problem.

(4 marks)

e. What is the probability that the new restaurant can start its business in less than 50 weeks?

(3 marks)

(Total: 20 marks)

Continued...

QUESTION 4

The Sandy Supermarket stocks Oats Cereal. The annual demand for the cereal is 3000 boxes per year and the supermarket is open throughout the year. Each box costs RM5 and it costs the store RM 60 per order of the cereal, and the holding cost per box per year is 15% of the purchase cost. The lead time to receive the order from a food distributor is 3 days.

a. Find the optimal order quantity. (4 marks)

b. Find the total inventory cost associated with the optimal order quantity. (5 marks)

c. What is the reorder point? (3 marks)

d. What is the cycle time? (3 marks)

e. If the store orders in quantities of 1000 boxes or more it can get 5% discount on the cost per box. Should they take the quantity discount? (5 marks)

(Total: 20 Marks)

QUESTION 5

Mr. Patrick who is the owner of Construction Company must decide between building a housing development, constructing a shopping center, and leasing all the company's equipment to another company. The profit that will result from each alternative will be determined by whether material costs remain stable or increase. The profit from each alternative, given the two possibilities for material costs is shown in the following table:

	Material Costs		
Decision	***Decrease***	***Stable***	***Increase***
Houses	$100,000	$70,000	-$10,000
Shopping Center	210, 000	105,000	-20,000
Leasing	40,000	40,000	40,000
Probability	0.2	0.4	0.4

a. Determine the best decision, using the following decision criteria:

(i) Maximax (2 marks)

(ii) Maximin decision (2 marks)

(iii) Equally likely criterion (3 marks)

(iv) Criterion of realism (use $\alpha = 0.8$) (3 marks)

Continued...

(v) Expected Monetary Value (3 marks)

(vi) Minimax regret decision? (4 marks)

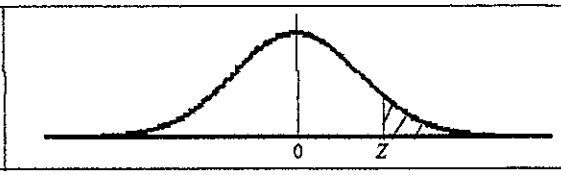
b. Mr. Patrick would like to gather more information about the market, how much is it worth to pay for the additional information? (3 marks)

(Total: 20 marks)

End of Paper

APPENDIX:

Table 1
The Upper Tail Area Under the Standard Normal Curve



Z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.4960	0.4920	0.4880	0.4840	0.4801	0.4761	0.4721	0.4681	0.4641
0.1	0.4602	0.4562	0.4522	0.4483	0.4443	0.4404	0.4364	0.4325	0.4286	0.4247
0.2	0.4207	0.4168	0.4129	0.4090	0.4052	0.4013	0.3974	0.3936	0.3897	0.3859
0.3	0.3821	0.3783	0.3745	0.3707	0.3669	0.3632	0.3594	0.3557	0.3520	0.3483
0.4	0.3446	0.3409	0.3372	0.3336	0.3300	0.3264	0.3228	0.3192	0.3156	0.3121
0.5	0.3085	0.3050	0.3015	0.2981	0.2946	0.2912	0.2877	0.2843	0.2810	0.2776
0.6	0.2743	0.2709	0.2676	0.2643	0.2611	0.2578	0.2546	0.2514	0.2483	0.2451
0.7	0.2420	0.2389	0.2358	0.2327	0.2296	0.2266	0.2236	0.2206	0.2177	0.2148
0.8	0.2119	0.2090	0.2061	0.2033	0.2005	0.1977	0.1949	0.1922	0.1894	0.1867
0.9	0.1841	0.1814	0.1788	0.1762	0.1736	0.1711	0.1685	0.1660	0.1635	0.1611
1.0	0.1587	0.1562	0.1539	0.1515	0.1492	0.1469	0.1446	0.1423	0.1401	0.1379
1.1	0.1357	0.1335	0.1314	0.1292	0.1271	0.1251	0.1230	0.1210	0.1190	0.1170
1.2	0.1151	0.1131	0.1112	0.1093	0.1075	0.1056	0.1038	0.1020	0.1003	0.0985
1.3	0.0968	0.0951	0.0934	0.0918	0.0901	0.0885	0.0869	0.0853	0.0838	0.0823
1.4	0.0808	0.0793	0.0778	0.0764	0.0749	0.0735	0.0721	0.0708	0.0694	0.0681
1.5	0.0668	0.0655	0.0643	0.0630	0.0618	0.0606	0.0594	0.0582	0.0571	0.0559
1.6	0.0548	0.0537	0.0526	0 0516	0.0505	0.0495	0.0485	0.0475	0.0465	0.0455
1.7	0.0446	0.0436	0.0427	0.0418	0.0409	0.0401	0.0392	0.0384	0.0375	0.0367
1.8	0.0359	0.0351	0.0344	0.0336	0.0329	0.0322	0.0314	0.0307	0.0301	0.0294
1.9	0.0287	0.0281	0.0274	0.0268	0.0262	0.0256	0.0250	0.0244	0.0239	0.0233
2.0	0.0228	0.0222	0.0217	0.0212	0.0207	0.0202	0.0197	0.0192	0.0188	0.0183
2.1	0.0179	0.0174	0.0170	0.0166	0.0162	0.0158	0.0154	0.0150	0.0146	0.0143
2.2	0.0139	0.0136	0.0132	0.0129	0.0125	0.0122	0.0119	0.0116	0.0113	0.0110
2.3	0.0107	0.0104	0.0102	0.0099	0.0096	0.0094	0.0091	0.0089	0.0087	0.0084
2.4	0.0082	0.0080	0.0078	0.0075	0.0073	0.0071	0.0069	0.0068	0.0066	0.0064
2.5	0.0062	0.0060	0.0059	0.0057	0.0055	0.0054	0.0052	0.0051	0.0049	0.0048
2.6	0.0047	0.0045	0.0044	0.0043	0.0041	0.0040	0.0039	0.0038	0.0037	0.0036
2.7	0.0035	0.0034	0.0033	0.0032	0.0031	0.0030	0.0029	0.0028	0.0027	0.0026
2.8	0.0026	0.0025	0.0024	0.0023	0.0023	0.0022	0.0021	0.0021	0.0020	0.0019
2.9	0.0019	0.0018	0.0018	0.0017	0.0016	0.0016	0.0015	0.0015	0.0014	0.0014
3.0	0.0013	0.0013	0.0013	0.0012	0.0012	0.0011	0.0011	0.0011	0.0010	0.0010
3.1	0.0010	0.0009	0.0009	0.0009	0.0008	0.0008	0.0008	0.0008	0.0007	0.0007
3.2	0.0007	0.0007	0.0006	0.0006	0.0006	0.0006	0.0006	0.0005	0.0005	0.0005
3.3	0.0005	0.0005	0.0005	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0003
3.4	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0002
3.5	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
3.6	0.0002	0.0002	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
3.7	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
3.8	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
3.9	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4.0	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000